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AUTHOR Guerrero, Frank; And Others
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ABSTRACT

This document outlines the 1985-86 Chapter I Corrective Mathematics Program in New York City. The program served 8,825 eligible students in 186 nonpublic schools. The major goals of the program were to alleviate students' diagnosed deficiencies in mathematical concepts, computation and problem solving and to assist students in applying these concepts and skills in everyday life. Students received instruction in groups of 8 to 10, 1 to 5 times per week. Program objectives stated that students would achieve an average gain of five Normal Curve Equivalents from pretest to posttest on standardized mathematics tests. The students' test results surpassed the success criterion. The document describes the program, reports student outcomes, presents conclusions and makes recommendations. (PK)

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CHAPTER I
CORRECTIVE MATHEMATICS
PROGRAM
1985-86

OEA Evaluation Report

FINAL EVALUATION REPORT

Robert Tobias, Administrator
John Schoener, Senior Manager

June, 1987

CHAPTER I
CORRECTIVE MATHEMATICS
PROGRAM
1985-86

Prepared by the
O.E.A.
Instructional Support
Evaluation Unit

Frank Guerrero,
Unit Manager

Sharon Walker,
Evaluation Specialist

Alan Pershing,
Evaluation Consultant

New York City Board of Education
Office of Educational Assessment
Richard Guttenberg, Director

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EVALUATION SUMMARY
1985-86

In 1985-86, the Chapter I Corrective Mathematics Program served 8,825 eligible students in 186 nonpublic schools in New York City. The major goals of the program were to alleviate students' diagnosed deficiencies in mathematical concepts, computation, and problem solving and to assist students in applying these concepts and skills in everyday life.

One hundred and twenty-nine teachers, supervised by one coordinator and two field supervisors, provided instruction to groups of eight to ten students one to five times per week for 30 to 60 minutes per session. Sixty-eight percent of the students received two or more hours of instruction per week; average student attendance was 93 percent.

The program served students in grades one through twelve; grades two through five accounted for 70 percent of the population. Sixty-three percent of the students participated in the Corrective Mathematics Program for the first time in 1985-86. Twenty-five percent were in their second year in the program, and 12 percent were participating for their third year.

Program objectives stated that students would achieve an average gain of five Normal Curve Equivalents (N.C.E.s) from pretest to posttest on standardized mathematics tests. In addition to the attainment of a five N.C.E. gain mandated by the State Education Department, educational and statistical significance of gains were also calculated to assist program staff in determining the emphasis for staff development.

The students' test results surpassed the success criterion. Student improvement on the Total Math score was 14.5 N.C.E.s. Average overall mean gains on the three subtests taken by the second through eighth grades showed similar gains: 13.5 N.C.E.s on the Concepts subtest, 15.7 N.C.E.s on the Computation subtest, and 11.1 N.C.E.s on the Applications subtest. In general, all overall mean gains and average within-grade gains were statistically significant and educationally meaningful.

Based on the 1985-86 program outcomes the following recommendations are made:

- Emphasize continued development of materials and curricula to help students to apply concepts and skills to everyday situations.

- Further assess student profiles and curricula in grades five, eight, and ten to determine if materials, curricula, or staff development activities should be modified for these grades.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

PROGRAM PURPOSE AND FEATURES

The Chapter I Corrective Mathematics Program provides remedial mathematics instruction to children who attend grades one through twelve in nonpublic schools in New York City. The major goals of the program are to alleviate students' diagnosed deficiencies in mathematical concepts, computation, and problem solving and to assist students in applying these concepts and skills in everyday life. Secondary goals are to improve students' self-image and to help them develop a more positive attitude toward mathematics.

ELIGIBILITY

Student eligibility for Chapter I services is determined by residence in a targeted attendance area and by scoring below a designated cut-off point on standardized reading tests. Students selected for participation in the Corrective Mathematics Program have also shown deficiency in mathematics skills on standardized mathematics tests.* In addition, the Chapter I Evaluation Reporting System specifies that students may be selected for Chapter I projects on the basis of classroom performance, teacher judgment, and achievement test data.

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*When additional class spaces were available, the program served students who met the residency and mathematics requirements, but did not score below a designated cut-off point on the reading tests.

In the Corrective Mathematics Program, preliminary selection was based on screening test scores. The nonpublic schools' annual testing program was used to screen students for Chapter I eligibility. Most of the nonpublic schools' annual tests are given in April or May, although some nonpublic schools test their students in October. Most schools used either the Scott-Foresman Test or the Comprehensive Test of Basic Skills (C.T.B.S.). Pupils were eligible for Chapter I services if they scored at or below the following grade equivalents (G.E.s):

GRADE	CUT-OFFS
2	2.4 Grade Equivalent*
3	3.1
4	3.9
5	4.7
6	5.7
7	6.7
8	7.7
9	8.7
10-12	Two or more years below grade level in reading

*A G.E. is the grade placement (year and month) of students for whom a given score is typical. Grade equivalents are not directly comparable across different tests. Moreover, because G.E.s are not spaced equally apart, they cannot be used in arithmetic or statistical calculations. Most important, a G.E. does not represent the level of work a student is capable of doing. For example, a ninth-grade student who obtains a G.E. of 11.6 does not belong in the eleventh grade. Rather, this score indicates that the student scored as well as a typical eleventh-grader would have scored on the ninth-grade level test. This may indicate above-average achievement, but does not indicate that the ninth-grader is ready for eleventh-grade level work.

STUDENTS SERVED

The Corrective Mathematics Program served 8,825 Chapter I-eligible students attending grades one through twelve in New York City nonpublic schools. In 1985-86 over two-thirds of the students served were in grades two through five, each of which had more than 1,000 participating students. Another 20 percent (1,739 students) were in grades six through eight. Nine percent of the students attended high school, with the number declining with increasing grade. Less than two percent (124 students) attended the first-grade readiness program. Table 1 shows student distribution by grade level, as well as by the number of years students have been in the Corrective Mathematics Program.

Sixty-three percent of the students participated in the program for the first time in 1985-86. Each year, the program serves new groups of first- and ninth-graders, i.e., students new to elementary school and high school. However, the proportion of new and returning students varied widely with grade level. Over 90 percent of the second-graders and nearly 100 percent of the ninth-graders were new to the program in 1985-86. Twenty-five percent of students have participated in the program for two years. The greatest proportion of those participating for a second year were in grades three through five. Approximately eight percent (693) of the students in the program were holdovers in their current grade in 1984-85.

Students in the Corrective Mathematics Program who showed social or emotional problems that interfered with academic

TABLE 1

Corrective Mathematics Program
Students' Participation, by Grade and Years in Program, 1985-86

Grade	Total N	Years in Program: 1 N	1 %[a]	2 N	2 %[a]	3 or more N	3 or more %[a]
1	124	124	100%	--	--[b]	--	--[b]
2	1,484	1,366	92	115	8%	3	--[b]
3	1,801	1,128	63	628	35	45	2%
4	1,608	815	51	530	33	263	16
5	1,263	542	43	388	31	333	26
6	977	488	50	261	27	228	23
7	505	267	53	129	25	109	22
8	257	117	46	73	28	67	26
9	477	475	100	1	--[b]	1	--[b]
10	197	129	65	68	35	--	--[b]
11	59	35	60	12	20	12	20
12	36	19	53	14	39	3	8
TOTAL[c]	8,788	5,505	63	2,219	25	1,064	12

[a]Percentage of grade total.

[b]The percentage is less than one percent.

[c]Thirty-seven students without data on years in program or grade are missing from the total population of 8,825 students.

- Sixty-three percent of the students participated in the Corrective Mathematics Program for the first time in 1985-86.
- Twenty-five percent of students have participated in the program since 1984-85. The greatest proportion of those participating for a second year were in grades three through five.
- Twelve percent of the students had been in the program for three or more years previously; the greatest proportion participating for at least the third year were in grades three through eight and in grade eleven.

progress also received services through the Clinical and Guidance Program. In 1985-86, over half (55 percent) of the students in Corrective Mathematics also participated in the Clinical and Guidance Program. In addition, some students in the Corrective Mathematics Program also attended other Chapter I programs: Corrective Reading, Reading Skills Center, and English as a Second Language (E.S.L.) Programs, and Instrumental Enrichment (I.E.), a supplement to the program.*

PROGRAM OBJECTIVES

The 1985-86 Corrective Mathematics Program objectives were:

1. First-grade students would gain an average of at least five normal curve equivalent units (N.C.E.s)** from pretest to posttest on the Total Mathematics score of the Stanford Early School Achievement Test (SESAT).

2. Students in grades two through eight would gain an average of at least five N.C.E.s from pretest to posttest on the Computation, Concepts, and Applications subtests of the Stanford Achievement Test (S.A.T.).

3. Students in grades nine through twelve would gain an average of at least five N.C.E.s from pretest to posttest on the Total Mathematics score of the Stanford Test of Academic Skills (TASK).

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*For a description of the I.E., Corrective Reading, Clinical and Guidance, Reading Skills Center, and E.S.L. Programs, see Appendix A.

**Normal Curve Equivalent scores are similar to percentile ranks but, unlike percentile ranks, are based on an equal-interval scale. The N.C.E.s are based on a scale ranging from 1 to 99, with a mean of 50 and a standard deviation of approximately 21. Because N.C.E. scores are equally spaced apart, arithmetic and statistical calculations such as averages are meaningful; in addition, comparisons of N.C.E. scores may be made across different achievement tests.

PROGRAM EVALUATION

The effectiveness of the 1985-86 Corrective Mathematics Program was assessed by comparing pretest and posttest student performance on nationally normed tests relevant to program goals and attendance. The instruments used to assess students' performance measured mathematical concepts, computation skills, and the ability to apply these concepts and skills.

The mathematics subtest of the SESAT assesses children's knowledge of the concepts of counting, numeration, measurement, and conservation of number, space, and volume. The S.A.T. yields three individual subtest scores -- for the Concepts, Computation, and Applications subtests -- as well as a Total Mathematics score. The Mathematics subtest of the TASK assesses knowledge of numerical concepts, computation skills, and applications to problem-solving situations, as well as the basic principles of algebra, geometry, and measurement.

The Chapter I Evaluation Model A was used to determine the program's impact on student achievement. Model A uses national norms to estimate what the performance of students would have been in the absence of the program. To use this model, all pretest and posttest scores were converted to N.C.E.s. Mean gain scores were calculated for all participants taking both pretest and posttests. In Model A, it is assumed that without special instruction students would score at the same N.C.E. on the posttest as they did on the pretest; therefore, any increase in scores from pretest to posttest is attributable to the program.

The State Education Department (S.E.D.) mandated evaluation objective for the Corrective Mathematics Program states that students' test results will show an average improvement of five N.C.E.s from pretest to posttest. In addition to the mandated criterion, the statistical significance of mean gains was determined. Also, to determine the educational meaningfulness of the students' gains, an effect size (E.S.),* which expresses N.C.E. gains in standard deviation units independent of the influence of sample size, was also calculated for each grade level. These addition analyses were done to assist the program staff in determining the emphasis of staff development.

SCOPE OF THE EVALUATION

The purpose of this report is to present the results of the evaluation of the 1985-86 Chapter I Nonpublic School Corrective Mathematics Program. The first chapter describes the program, detailing the program's objectives, the evaluation procedures used in the report, and the scope of the evaluation. Program organization and funding are discussed in Chapter II, Chapter III describes the major program outcomes, and conclusions and recommendations are offered in Chapter IV.

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*The E.S., developed by Jacob Cohen, is the ratio of the mean gain to the standard deviation of the gain. This ratio provides an index of improvement in standard deviation units irrespective of the size of the sample. According to Cohen, .2 is a small E.S., .5 is a moderate E.S., and .8 is considered a large E.S. Only an E.S. of .8 or above is considered educationally meaningful.

II. PROGRAM ORGANIZATION

PROGRAM ORGANIZATION AND FUNDING

During 1985-86 the program staff included the coordinator, two field supervisors, and 129 teachers. There were 8,825 eligible students in 186 New York City nonpublic schools who participated. Chapter I (E.C.I.A.) funding totalled approximately $6 million.

Corrective Mathematics teachers provided instruction to small groups of students one to five times per week for the entire school year. The length of each session ranged from 30 to 60 minutes. Sixty-eight percent of the students received at least two hours of remedial instruction per week.

CURRICULUM

Program instruction emphasized developmental and discovery learning through the use of a wide range of motivating activities and materials. Manipulatives such as Cuisenaire rods, geoboards, play money, fraction pies, tape measures, and balance scales offered students opportunities to concretely represent and explore mathematical concepts. Visual or pictorial aids were also used to illustrate practical applications, problem-solving tasks, and abstract mathematical concepts. Mathematics games, workbooks of basic skills, kits, audio-visual equipment, computer software, and teacher-made materials were used to reinforce mathematical concepts and basic facts, and to help individualize instruction. Real life applications of mathematics, such as

check writing, cooking, and telling time, were included in the curriculum.

A typical session included a combination of individualized work, peer-group interaction, and whole-class instruction. Since students must show a deficit in reading skills to be eligible for the Corrective Mathematics Program, the curriculum also stressed those skills essential to all learning: listening, reading comprehension, and reasoning. For example, oral or written presentations of problem-solving situations were accompanied by pictures or concrete representations to help students understand the problem and its solution. Students were also encouraged to read problems aloud, analyze them, and explain the process by which they arrived at a specific answer.

The first-grade students participated in a special readiness program designed to teach them the basic mathematics concepts considered prerequisites for learning number computations. Instruction emphasized concepts such as one-to-one correspondence, geometric shapes, positional relationships, patterning, ordering, and money values. "Learning by doing" activities, in which students were able to manipulate concrete materials, were emphasized.

STAFF DEVELOPMENT

Eighteen staff development conferences/workshops were held in 1985-86 for program staff. Workshops were developed by the coordinator and three field supervisors, and also included presentations by program teachers and guest speakers such as the

Assistant Director of the Computer and Information Sciences Unit and representatives from publishing firms.

Workshops included discussions, demonstrations, and "make it and take it" and "hands-on" activities. A major focus of the 1985-86 training sessions was the use of computers, including such topics as: Educational Uses of Computers; How a Computer Works; Evaluation of Relevant Software; and, Computer Literacy. Other topics included:

-- Demonstrations of new materials

-- Strategies for Identification and Prevention of Suicide with School-age Children

-- Theory of Numbers

-- Topics in Algebra:

- Translating Algebraic Expressions
- Graphing Linear Equations
- Factoring Polynomials
- Solving Quadratic Equations Using Various Methods

-- Toothpick Math, Scrambled Math, Snoopy Coordinates

-- Solving the Problem of Problem Solving

-- Solving Verbal Problems Algebraically

III. STUDENT OUTCOMES

The success of the Corrective Mathematics Program was assessed by analyzing gains in academic achievement. Data on test scores, attendance, and grade level were obtained from data retrieval forms completed by Chapter I teachers. Students' attendance rates and analyses of students' performance on standardized tests, both overall and broken down by grade and length in program, are discussed in this chapter.

ATTENDANCE

Students in the Corrective Mathematics Program attended 30 to 60 minute sessions from one to five times per week. Sixty-eight percent of the children for whom there are complete pretest and posttest data received two or more hours of instruction per week. Average attendance of all children involved in the program was 93 percent.* This high rate of attendance suggests that the students were positively involved with the program. (The overall attendance rate for New York City public school students was 85.3 percent for the 1985-86 school year.)

ACADEMIC ACHIEVEMENT FINDINGS

Evaluation Criteria

Standardized tests were administered in the fall, 1985 and the spring, 1986. First-graders took the mathematics section of the SESAT. In the second through eighth grades, the Concepts,

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*Aggregate attendance information was provided by program administration to O.E.A. and the S.E.D.

Computation, and Applications subtests of the S.A.T. were administered. Ninth- through twelfth-graders were given the Mathematics subtest of the Stanford TASK.

Data were analyzed for those program participants (94 percent) who had valid pretest and posttest scores. In the second through eighth grades, the individual subtests, as well as the Total Mathematics score, were analyzed. Mean pretest, posttest, and gain scores were calculated for the entire sample and each grade level. The S.E.D. criterion for success was a five N.C.E. mean gain. Beyond the S.E.D. criterion, the E.S. of the mean gain scores was also obtained to determine educational meaningfulness. Correlated t-tests were used to determine if gains were statistically significant. The additional analyses were done to assist the program staff in determining the emphasis for staff development.

Academic Achievement Findings

Table 2 shows the mean N.C.E. Total Mathematics pretest, posttest, and gain scores analyzed by grade level. Effect size is also shown.

Mean Total Mathematics pretest means ranged from 14.3 N.C.E.s to 32.5 N.C.E.s, with an overall mean of 25.2 N.C.E.s. The mean pretest scores for all grade levels, 25.2 N.C.E.s, was below the score the state uses to define educationally disadvantaged students -- 35 N.C.E.s. On the posttest, the overall mean score was 39.7 N.C.E.s, and the mean score for each of the grades was between 35.4 and 46.9 N.C.E.s. Mean posttest scores for all

TABLE 2

Mean N.C.E. Total Score Gains of Full-Year Corrective Mathematics Students, by Grade, on the Norm-Referenced Mathematics Tests, 1985-86

Grade	N	Pretest		Posttest		Difference[a]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
1	91	14.3	11.5	46.9	18.7	32.6	20.2	1.6
2	1,226	18.3	12.3	38.9	15.8	20.6	13.4	1.5
3	1,608	22.4	11.4	37.3	15.9	14.9	12.8	1.2
4	1,421	27.5	11.3	43.6	15.3	16.1	11.9	1.4
5	1,135	27.8	11.4	37.3	15.6	9.5	12.9	.7
6	862	26.2	11.2	39.8	14.2	13.6	10.8	1.3
7	462	32.0	10.1	41.5	10.4	9.5	10.7	.9
8	240	30.0	10.3	35.4	9.9	5.4	9.1	.6
9	377	28.8	12.2	44.4	13.1	15.6	12.4	1.3
10	125	30.8	10.9	37.7	10.7	6.9	9.5	.7
11	39	30.6	11.1	43.7	12.3	13.1	8.9	1.5
12	14	32.5	11.9	42.9	11.6	10.4	4.9	2.1
TOTAL	7,600	25.2	12.2	39.7	15.2	14.5	13.1	1.1

[a]All differences were statistically significant at $p \leq .05$.

- The overall mean pretest-posttest gain was 14.5 N.C.E.s. This gain was statistically significant and educationally meaningful.
- Average grade gains ranged from five to 33 N.C.E.s. All the average grade gains were statistically significant.
- The gains represented moderate to large effect sizes.

grades fell below 50 N.C.E.s, the level achieved by the average student in the national norming sample.

The overall mean gain from pretest to posttest was 14.5 N.C.E.s. Excluding the mean gain for the first grade,* gains for individual grades ranged from 5.4 N.C.E.s in grade eight to 20.6 N.C.E.s in grade two. Mean gains for each grade exceeded the evaluation objective of a five-N.C.E. gain.

Gains for all grades were statistically significant at the .05 level. Given the large sample sizes in grades two through ten, it is likely that even relatively small gains would be statistically significant; therefore, the E.S. statistic, which expresses N.C.E. gains in standard deviation units independent of the influence of sample size, is a more meaningful indicator of the importance of these gains. The E.S. for all grade levels, except for grades five, eight, and ten, exceeded the .8 level, indicating that the mean gains were educationally meaningful.

Tables 3, 4, and 5 show the mean pretest and posttest scores, mean gains** and E.S.s for the three mathematics subtests

*The exceptionally high gain for first-graders (32.6 N.C.E.s) has been typically noted in previous evaluations of the Corrective Mathematics Program. Mean pretest scores for first-graders (14.3 N.C.E.s) were substantially lower than those for students in other grades, suggesting that the large gains were partially due to the regression to the mean.

**The exceptionally high gain scores for second- and third-graders has been noted in previous evaluations. The pretest scores for these students were lower than for students in other grades, suggesting that the large gains were partially due to regression to the mean. In addition, the extremely low pretest scores indicate that children began school knowing few basic concepts. Young children tend to rapidly learn basic skills like counting and number recognition when first given instruction.

TABLE 3

Mean N.C.E. Score Gains of Full-Year
Corrective Mathematics Students, by Grade, on the Concepts Subtest
of the Stanford Achievement Test, 1985-86

Grade	N	Pretest		Posttest		Difference[a]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
2	1,302	18.6	13.1	38.5	17.4	19.9	15.8	1.3
3	1,614	24.2	12.7	36.7	16.3	12.5	15.1	.8
4	1,431	27.3	13.9	43.5	17.6	16.2	15.3	1.1
5	1,138	31.6	13.9	39.9	16.5	8.3	15.4	.5
6	867	29.9	14.0	42.3	14.9	12.4	14.2	.9
7	463	34.1	12.8	43.5	12.1	9.4	14.2	.7
8	240	28.7	12.7	35.8	11.9	7.1	11.8	.6
TOTAL	7,055	26.5	14.2	40.0	16.5	13.5	15.6	.9

[a]All differences were statistically significant at $p \leq .05$.

- The overall mean gain was 13.5 N.C.E.s. This mean gain was statistically significant and educationally meaningful.
- Grade mean gains ranged from 7.1 to 19.9 N.C.E.s. All the grade mean gains were statistically significant. Effect sizes were moderate to large.

TABLE 4

Mean N.C.E. Score Gains of Full-Year
Corrective Mathematics Students, by Grade, on the Computation Subtest
of the Stanford Achievement Test, 1985-86

Grade	N	Pretest		Posttest		Difference[a]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
2[b]	1,247	21.0	14.1	41.0	16.4	20.0	15.6	1.3
3	1,614	28.7	15.0	45.5	19.8	16.8	19.2	.9
4	1,434	33.2	15.2	53.1	19.3	19.9	18.7	1.1
5	1,140	32.3	14.4	43.7	18.8	11.4	17.5	.7
6	867	30.1	15.1	42.7	16.6	12.6	14.9	.8
7	463	32.5	12.9	40.9	12.1	8.4	13.9	.6
8	240	30.7	13.0	36.5	11.7	5.8	11.6	.5
TOTAL	7,005	29.3	15.2	45.0	18.5	15.7	17.7	.9

[a]All differences were statistically significant at $p \leq .05$.

[b]Second-graders took a combined Computation and Applications subtest.

- The overall mean gain was 15.7 N.C.E.s. This gain was statistically significant and educationally meaningful.
- Average grade gains ranged from 5.8 to 20 N.C.E.s. All the average grade gains were statistically significant and represented moderate to large E.S.s.

TABLE 5

Mean N.C.E. Score Gains of Full-Year
Corrective Mathematics Students, by Grade, on the Applications Subtest
of the Stanford Achievement Test, 1985-86

Grade[a]	N	Pretest		Posttest		Difference[b]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
3	1,610	22.5	13.7	36.8	15.9	14.3	14.7	1.0
4	1,425	28.9	11.7	38.5	14.6	9.6	12.5	.8
5	1,133	25.3	13.1	33.8	16.0	8.5	14.5	.6
6	865	25.4	12.4	37.1	14.6	11.7	13.2	.9
7	461	29.4	12.3	41.1	11.8	11.7	13.6	.9
8	239	26.8	12.9	34.9	12.0	8.1	13.3	.6
TOTAL	5,733	25.8	13.0	36.9	15.1	11.1	14.0	.8

[a]Second-graders took a combined Computation and Applications subtest. For test results, see Table 4.

[b]All differences were statistically significant at $p \leq .05$.

- The overall mean gain was 11 N.C.E.s. This gain was statistically significant and educationally meaningful.
- Average grade gains ranged from 8.1 N.C.E.s to 14.3 N.C.E.s. All these gains were statistically significant and, in general, educationally meaningful.

ranged from 18.6 N.C.E.s to 34.1 N.C.E.s, with an overall mean of 26.5 N.C.E.s. Posttest scores ranged from 35.8 N.C.E.s to 43.5 N.C.E.s, with an overall mean of 40.0 N.C.E.s.

The mean gain scores ranged from 7.1 N.C.E.s to 19.9 N.C.E.s, with an overall mean of 13.5 N.C.E.s. The overall mean gain score, and the mean gains for all grades except fifth, seventh, and eighth, were more than twice as high as the evaluation objective of a gain of five N.C.E.s.

All mean gains were statistically significant at the .05 level. The E.S. of the overall gain, .9, indicates a large, educationally meaningful increase in scores. Effect sizes for each grade except the fifth, seventh, and eighth grades were large enough to be educationally meaningful; fifth- and eighth-grade E.S.s indicate a moderate gain in performance.

On the Computation subtest (Table 4), the overall mean pretest score was 29.3 N.C.E. with individual grade means ranging from 21.0 N.C.E.s to 33.2 N.C.E.s. The posttest mean scores ranged from 36.5 N.C.E.s to 53.1 N.C.E.s, with an overall posttest mean of 45.0 N.C.E.s. The overall mean gain score was 15.7 N.C.E.s, with individual grade mean gains ranging from 5.8 N.C.E.s to 20.0 N.C.E.s.

The overall pretest, posttest, and mean gain scores for the Computation subtest were higher than for either of the other two subtests. The mean posttest score for each grade, except the seventh, exceeded that obtained on the other two subtests, and the fourth-grade posttest mean, 53.1 N.C.E.s, exceeded the mean

level in the nationally normed sample, 50 N.C.E.s.

All mean gain scores were statistically significant at the .05 level. The E.S. of the overall mean gain and that of all grade levels except the fifth, seventh, and eighth grades were large and considered educationally meaningful. The gains made by the fifth-, seventh-, and eighth-graders indicated a moderate gain in performance.

On the Applications subtest (Table 5), scores are only available for third through eighth grades, as the Computation and Applications subtests are combined at the second-grade level. Mean pretest scores ranged from 22.5 to 29.4 N.C.E.s, averaging 25.8 N.C.E.s. Mean posttest scores ranged from 33.8 N.C.E.s to 41.1 N.C.E.s, with an overall mean of 36.9 N.C.E.s.

The overall mean gain score was 11.1 N.C.E.s and ranged from 8.1 N.C.E.s to 14.3 N.C.E.s. Mean gain scores for each grade exceeded the program objective of a gain of five N.C.E.s, and the overall mean gain was more than double this criterion. All mean gain scores were significant at the .001 level. The E.S. of .8 indicated that the overall mean gain was educationally meaningful, as were those of all grades except the fifth and seventh grades. The E.S.s of the fifth- and eighth-grade mean gain scores indicated a moderate increase in performance.

IV. CONCLUSIONS AND RECOMMENDATIONS

Analysis of the pretest and posttest data for students in the 1985-86 Corrective Mathematics Program indicates that the program had a statistically significant and educationally meaningful impact on pupils' mathematics achievement.

Program objectives stated that students' test results would show a mean gain of at least five N.C.E.s from pretest to posttest. This objective was achieved by all grade levels on all subtests given and on the Total Mathematics score. In addition, average gains for the total student group showed an increase of more than double the criterion--a gain of five N.C.E.s.

The achievement gains' educational significance was further evaluated with the E.S. statistic, which expresses N.C.E. gains in standard deviation units independent of the influence of sample size. Overall gains on all test scores reached at least the .8 level, considered indicative of an educationally meaningful improvement. The E.S. of Total Mathematics scores for the individual grades also reached the educationally meaningful .8 level for all grades except the fifth, eighth, and tenth grades, which showed only moderate improvement.

Based on the evaluation findings and other information presented in this report, the following recommendations are made:

- Emphasize continued development of materials and curricula to help students apply concepts and skills to everyday situations.
- Further assess student profiles and curricula in grades five, eight, and ten to determine if materials, curricula, or staff development activities should be modified for these grades.

Brief Description of Chapter I Nonpublic School Reimbursable 1985-86 Programs

CORRECTIVE READING PROGRAM

The Chapter I Corrective Reading Program provides supplemental individualized instruction in reading and writing skills to Chapter I-eligible students who score below grade level in reading on standardized tests. The program's goal is to enable students to reach grade level and to perform well in their regular classrooms. The program uses a modified diagnostic-prescriptive approach. During 1985-86, program staff included one coordinator, two field supervisors, and 173 teachers who worked with 10,832 students in grades one through twelve at 238 schools.

READING SKILLS CENTER PROGRAM

The Chapter I Reading Skills Center Program provides supplemental individualized instruction in reading and writing skills to Chapter I-eligible students who score below grade level in reading on standardized tests. The program's goal is to enable students to reach grade level and to perform well in their regular classrooms. The program uses a modified diagnostic-prescriptive approach based on the High Intensity Learning System. One coordinator and 16 teachers worked with 510 students at nine schools.

CORRECTIVE MATHEMATICS PROGRAM

The Chapter I Corrective Mathematics Program provides remedial mathematics instruction to Chapter I students in grades one through twelve with diagnosed deficiencies in mathematics. The main goals of the program are to alleviate deficiencies in mathematical concepts, computation, and problem solving and to assist students in applying these concepts and skills in everyday life. One coordinator, two field supervisors, and 129 teachers served 8,825 students in 186 nonpublic schools.

ENGLISH AS A SECOND LANGUAGE (E.S.L.) PROGRAM

The Chapter I E.S.L. Program provides intensive English language instruction to Chapter I students whose first language is not English. The main goal of the program is to provide students with opportunities to use oral and written English in

situations similar to those they might encounter in everyday life. The program in 1985-86 was staffed with one coordinator, two field supervisors, and 80 teachers. They provided services to 4,305 students in 111 nonpublic schools.

CLINICAL AND GUIDANCE PROGRAM

The Chapter I Clinical and Guidance Program consists of diagnostic services and counseling support for nonpublic school students enrolled in Chapter I remedial programs. Chapter I teachers refer students who show signs of social or emotional problems thought to inhibit academic performance. The Clinical and Guidance Program is seen as a service helping students to overcome obstacles standing in the way of better academic achievement. Program staff consisted of two coordinators, three field supervisors, 123 guidance counselors, 57 clinicians, and 23 social workers serving 10,533 students in 201 schools.

INSTRUMENTAL ENRICHMENT PROGRAM

The Chapter I Instrumental Enrichment (I.E.) Program is a supplement in eight nonpublic schools to ongoing remedial Chapter I programs in Corrective Reading, Corrective Mathematics, Reading Skills Center, and English as a Second Language (E.S.L.). The program is designed to provide instruction in higher-order thinking and problem-solving skills to participating students. In 1985-86, the program expanded to 29 teachers serving 561 students in 24 schools.